Journal of Magnetic Resonance - Series A 1996 vol.123 N1, pages 16-25

The theory of ESR hyperfine-structure narrowing as applied to wide-gap semimagnetic semiconductors

Aliev M., Tagirov L., Tagievf V.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

The theory of ESR hyperfine-structure exchange narrowing is developed. The kinetic equations describing the nonequilibrium magnetization dynamics of hyperfine components of ESR spectra are derived by using the nonequilibrium statistical-operator method. Numerical solution of these general equations is applied to the simulation of the experimental spectra of (Cd, Mn)Te crystals with a Mn2+ ion content of between 0.05 and 0.5%. The hyperfine-splitting constant, homogeneous ESR linewidth, and meansquare value of the exchange fluctuation frequency are obtained from the fitting of the spectra for different concentrations of manganese ions. The concentration dependence of the latter quantity is discussed in relation to the spatial dependence of magnetic-ion exchange interaction and the gap value in the band structure of semimagnetic semiconductors, © 1995 Academic press, inc.